subsequent annual charge at about 2000*l*. It would seem therefore that we may shortly expect to find a tolerably complete and well-equipped observatory in the most eastern of our possessions. It is believed also that, with the assistance of Mr. Hart, the Inspector-General of Chinese Customs, the Government of China may be induced to establish a series of meteorological stations at various points on the seaboard of their vast territory. A perusal of Major Palmer's report leaves on our mind the impression that the Colonial Government is fortunate in being able to obtain at the present time the advice and co-operation of an officer of his ability and scientific attainments.

PROBING BY ELECTRICITY[1]

THE instrument[2] I have the honour of presenting to the Academy has for its object the determination of the exact place occupied by balls of lead, fragments of shell, or metallic substances of any kind embedded in the body of a person wounded by firearms; and it may be considered as a form of the well-known induction-balance of Prof. Hughes.

This exploring instrument enables us to determine that position for the most part with very great exactness, and that without any pain to the patient, which is not the case when we use metallic probes, which require to be brought into direct contact with the projectile.

The instrument is composed essentially of a system of two parallel flat coils partially superposed upon one another in such a manner that the edge of one is nearly over the axis of the other (Fig. 1). One of these coils (A) is made of thick wire constituting a portion of the primary circuit, and the other (B) of thin wire, constituting a portion of the secondary circuit. Both coils are imbedded in a mass of paraffine placed in the interior of the wooden case furnished with a handle.

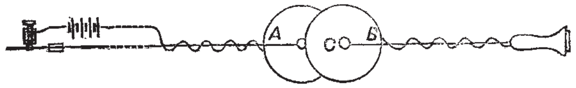

FIG. 1.

A vibratory current from a galvanic battery traverses the primary coil, and the secondary circuit includes an ordinary telephone. Under these circumstances no sound is heard from the telephone; but if we cause any metallic body to approach the part (C) common to the two coils, the silence immediately gives place to a sound the intensity of which will depend upon the nature of the metallic body, upon its form, and upon its distance. We may remark in this connection that the most favourable form that can be assumed by the projectile for which we explore, is that of a flat disk with its face parallel to the surface of the skin, and that the most unfavourable, a similar disk with its face perpendicular to the same surface.

It is difficult in practice to obtain the exact adjustment of the coils required, and it is therefore found advisable to introduce into the primary and secondary circuits respectively two other coils (D and E, Fig. 2) analogous to the first, but very much smaller, whose common surface can be modified by the play of a micrometer screw.

By means of this fine adjustment we are able easily to reduce the telephone to the most complete silence. It should be added that the effects obtained when a condenser (F) is introduced into the primary circuit are much inferior to those obtained without, as had been independently predicted by Prof. Rowland of Johns Hopkins University.

If we wish to ascertain the depth at which the metallic mass lies embedded this is easily ascertained if we know *à priori* its form, its mode of presentation, and its substance. It is only necessary to adjust the apparatus to silence while it is applied to the skin, after which, removing the apparatus, we bring near it another metallic mass similar to that explored for, so as to reproduce silence anew, and the distance of this mass from the exploring instrument gives the measure which it is desired to determine.

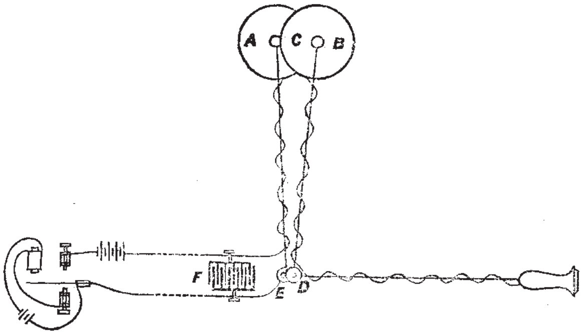

FIG. 2.

I conclude this Note by the relation of an experiment made in the office of Dr. Frank Hamilton of New York, on October 7 last, in the presence of thirteen eminent surgeons.[1] The experiment was made upon the person of Col. B. F. Clayton, wounded in 1862. The ball entered in front through the left clavicular articulation, breaking the clavicle. Doctors Swineborne and Vanderpool supposed that it was lodged under the scapula, but my apparatus demonstrated, on the contrary, that it was located in front and just below the third rib.

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[1] Upon an Apparatus for Determining without Pain to the Patient the Position of a Projectile of Lead or other Metal in the Human Body. Note by Prof. Alexander Graham Bell, read by M. Antoine Breguet at the Paris Academy of Sciences. Contributed by the Author.

[2] This instrument has originated from researches undertaken in the Volta Laboratory at Washington on the occasion of the sad attempt upon the life of President Garfield. This Note is preliminary to a paper which I shall publish shortly, giving a complete account of these researches. So many different persons have been kind enough to give me the benefit of their suggestions and advice concerning the method of exploration for this object, that I can only mention here the names of a few: Prof. Hughes, George M. Hopkins, Sumner Tainter, Thomas Gleeson, Dr Chichester A. Bell, Charles E. Buell, Prof. Simon Newcomb, Prof H. A. Rowland, M. Rogers, Prof. John Trowbridge, J. H. C. Watts, the director of the Western Union Telegraph Company at Washington, and the correspondent of the *New York Tribune* at Washington.

[1] Doctors G. H. Gardner, G. Durant, Ed. Birmingham, N. Bozeman, L. Damainville, J. N. Hinton, Francis Delagield, F. H. Hamilton, D. Chamberlain, Elias Marsh, J. G. Johnson, Joseph Halderson, and J. G. Allan.

MAGNETIC SURVEY OF MISSOURI

IN NATURE, vol. xxiii. p. 583, the writer presented a chart of magnetic declination which represented the results at forty-five stations in Missouri. The facts seemed to indicate a marked effect due to contour. Up to the middle of August of the past summer nothing inconsistent with this explanation was found, although the number of stations had been increased to over eighty. By that time the stations had become so numerous in Central Missouri that a more minute survey along the river bank between Jefferson City and Glasgow gave promise of affording a crucial test. It was necessary that the 8° line, which bends down the river, crossing at some point east of the mouth of the Osage River, should *return* on the south side of the river, looking something like a reversed contour line.

What we did find was, that the 8° line crosses the Missouri Valley *without bending*, running south-west to near the summit of the "divide" between the Osage and Missouri rivers, and *then* bends abruptly to the north-east, re-crossing the Missouri above Jefferson City, and

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after a wide *détour* re-crosses east of Hermann, returning to the south-west, thus forming an immense cape-like area of maximum declination to the east of Jefferson City. It is therefore improper to regard the chart referred to as more than a representation of observations then made, although the stations were more numerous than is usually deemed necessary for an area of 60,000 square miles.

The area of minimum declination represented on the chart of April 21 has been more satisfactorily outlined, and a closed area of maximum declination lying to the west has been determined with certainty.

The work of the past summer has therefore increased the complexity of the isogonic lines, and the *gradual* change in declination in passing through these areas of abnormal value shows that the causes must act over areas of from 1000 to 3000 square miles, *i.e.* that the observed effect is not due to minute local causes at the several stations. It will not be possible to determine fully the extent of these abnormal influences until similar work done in adjoining States shall enable a more precise determination of *normal* values. The stations of observation in Missouri now number over 100. Arrangements for the summer of 1882 have already been made, and the survey will be carried forward on a still more extended scale. FRANCIS E. NIPHER

St. Louis, October 8

THE ECHINOIDS OF THE "CHALLENGER"

ZOOLOGISTS in general, and echinologists in particular, will welcome vol. iii. part 9 of the "Report on the Scientific Results of the Voyage of H.M.S. *Challenger*," which has just been published. It deals with the Echinoidea, and has been prepared by Prof. A. Agassiz, a more competent reporter than whom it would be difficult, if not impossible, to find. We do not propose to do more than give a brief outline of the principal results brought to light in this portly volume, which runs over some three hundred pages of text, and is illustrated by sixty-five plates.

Commencing with a few remarks on classification, Prof. Agassiz passes on to treat at more length of that vexed question of the position of the axis of the Echinoidea. He dissents from the theory put forward by Lovén in his "Études," a memoir which, however much one may differ from it, cannot be read without a feeling of admiration of the "infinite skill"—to quote Prof. Agassiz's happy expression—displayed by the author. Our reporter again asserts the position he has all along held, that, judging from embryological data, the position of the axis is in the main determined by that of the madreporiform plate. Next in order he deals with the structure of the coronal plates, the anal system, the fascioles, and the structure of the spines. In connection with the latter subject Prof. Agassiz takes exception to some views which we have elsewhere put forward as to the systematic value of acanthological characters. His opinions on any point of Echinoid structure merit the highest respect, and so we do not propose to enter here into an examination of his criticism on our work—a criticism, be it said, which is conceived in the true scientific spirit. A more fitting opportunity will offer itself in a further communication on the subject with which we are at present engaged. The reporter then goes on to notice with extreme aversion the attempts to construct "genealogical trees" "which have become so fashionable." In spite of Prof. Agassiz's well-earned reputation, however, one reads with a sort of shudder the assertion that he is about "to show once for all how futile it must be to carry on" these attempts, especially when we remember the men of mark who engage in them. But a genealogical tree is a upas tree to Prof. Agassiz, and he attacks it with hearty good will, albeit we think that the mathematical axe which he wields is by no means so destructive as he appears to believe. That relations exist between the different groups of Echini no one knows better than Prof. Agassiz, and in the next two or three sections of his Report he shows how well he can use his knowledge in the interesting connections he traces between recent and fossil Urchins, and since this relation does exist we cannot see why the attempt to indicate it graphically or descriptively is to be condemned as futile, even though there may be a minimum of 2^{19} possible combinations of variables. Having passed in review the relations between recent and fossil Echinoids the reporter then comes to what is the real sum and centre of his Report, the description of the species and genera, and here we have an abundance of most interesting matter.

The *Challenger* Expedition has added fifty-two new species, comprised in fifteen new genera, to our list of Echinoids, a very considerable addition when we remember that the order is a comparatively small one. The group which has been most largely increased is that of the Echinothuridæ, of which twelve new species have been described, whilst of the Echinometridæ, Clypeastridæ, and Spatangina only previously known forms have been obtained. It would be of course out of the question to notice all the interesting facts brought to light here; the Report itself must be read for this, and we are fain to content ourselves with a few passing remarks on some of the more striking forms. The remarkable genus Asthenosoma, which was established by Grube in 1867 (Calveria, Wyville Thomson, 1869) to contain an Urchin with a flexible test has been increased by the addition of five new species with a very varied bathymetrical range, one having been obtained at 10 fathoms and another at 1400. Wyville Thomson's genus, Phormosoma (1874), has afforded seven new and most interesting species, inhabiting, as a rule, deeper water than its companion genus (255 fathoms to 2600 fathoms). To this genus belongs the honour of furnishing the largest Urchin which Prof. Agassiz has hitherto met with, *Ph. hoplacantha*, Wy. Thoms., measuring 312 mm. in diameter—truly a good-sized specimen. Amongst the Didematidæ we have a remarkable new genus, Aspedodiadema, with the abactinal system and ambulacral plates of a Cidarid combined with the thin test and hollow spines of a Diadema. Micropyga is another hitherto undescribed genus of the same family. Passing over the Echinometridæ (no new species), the Temnopleuridæ (three new species), the Triplechinidæ (one new species), and the Clypeastridæ (no new species), we notice amongst the Petalosticha thirteen new species of the curious genus Pourtalesia (A. Agass., 1869) with its remarkable beaked test; and, amongst other new genera, Cystechinus, which appears to be related to the fossil genera Galerites and Ananchytes. We might go on for a long time noting one interesting form after another, were it not that to do so would make this notice inordinately long. How far further study and discovery will affect the number of genera and species enumerated here it is impossible to say, but as Prof. Agassiz is by no means given to multiplying species, and as most of the specimens appear to have been well preserved—only a few having been described from fragments—it is likely that the greater number will stand. A word in conclusion as to the plates. The majority of them have been drawn by Mr. Roetter, and we congratulate Prof. Agassiz on having at his disposal the services of so gifted a draughtsman. Many of the plates are to our mind very gems of lithographic art. The drawings of the sections of spines, though very pretty, and in most instances handled with great delicacy and finish, do not always give the clearness of detail that could be desired, and the mechanical arrangement both of these plates and of those containing the pedicellariæ and the side views of spines is decidedly objectionable. It may be that Prof. Agassiz and his

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